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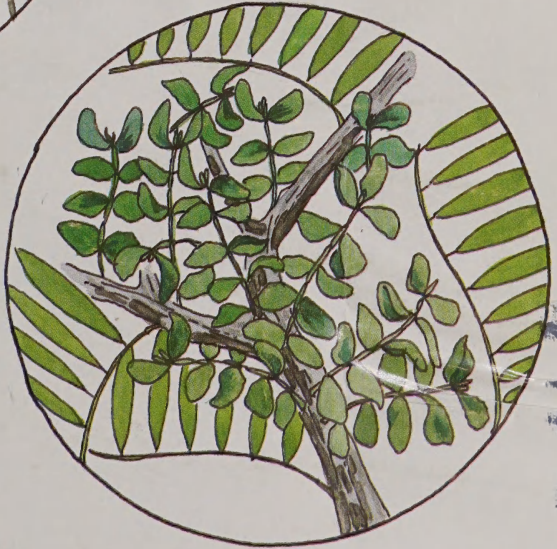
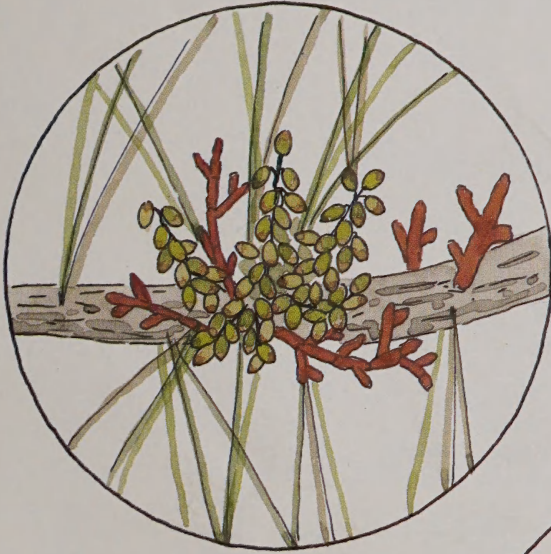
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# A GUIDE TO MISTLETOES

## of ARIZONA and NEW MEXICO



**Southwestern Region**  
U.S. Department of Agriculture  
Forest Service

# ACKNOWLEDGEMENTS

The author appreciates the technical

assistance provided by

Edward M. Sharon

and

Frank G. Hawksworth

in the preparation of

this publication.

Acknowledgement is given to

Peggy Morgan

for the cover illustrations.

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# **A GUIDE TO MISTLETOES**

## **of Arizona and New Mexico**

**By James W. Walters**

**March 1976**



Forest Insect and Disease Management  
State and Private Forestry  
Southwestern Region, Forest Service, USDA  
517 Gold Avenue, SW  
Albuquerque, New Mexico 87102

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## INTRODUCTION

The mistletoes are parasitic plants that have a harmful effect on their woody hosts. The two types of mistletoe found in Arizona and New Mexico are dwarf mistletoe (*Arceuthobium* sp.) and true mistletoe (*Phoradendron* sp.). The dwarf mistletoes parasitize only coniferous trees, while true mistletoes infect conifer and hardwood trees and shrubs. As parasites, mistletoes compete with their host for nutrients and water taken up or synthesized by their hosts. This competition results in reduced host vigor, which often makes the tree more susceptible to other diseases and/or insects and sometimes causes death of the tree. Thus, the effects of mistletoe on its host become an important consideration for both the land manager and homeowner.

### Objective

The objective of this paper is to provide a guide to mistletoes found in Arizona and New Mexico. Recognition and subsequent identification of the casual organism is the first step in obtaining a better understanding of any disease problem. Information relative to mistletoe distribution, damage, and hosts is included in this guide. General principles of mistletoe control also are given.

### Dwarf Mistletoes

In Arizona and New Mexico, there are nine species of dwarf mistletoe infecting coniferous tree species. The biology of these parasitic plants has received extensive coverage by Hawksworth and Wiens (1972) and, therefore, will not be repeated here. Research results have established the detrimental effects of various dwarf mistletoe species on their hosts (Baranyay 1972, Hawksworth 1961, Hawksworth and Graham 1963). Dwarf mistletoe reduces the growth rate, vigor, cone and seed production, seed viability, and merchantability of heavily-infected trees. Also, mortality rates for heavily-infected trees are higher than for non-infected trees (Hawksworth and Wiens 1972).

Symptoms of dwarf mistletoe infection often include swelling of the branch at an infection site, formation of a resin-soaked canker at an infection site on the bole, and formation of witches' brooms. Witches' brooms are dense clusters of branches that may result from infection by dwarf mistletoe or from several other factors. Figures 1-4 show

typical symptoms caused by dwarf mistletoe infections. Symptoms of dwarf mistletoe infection may vary with the mistletoe species and the host species.

Control of dwarf mistletoe can be accomplished by cultural treatment of infected trees. Within the forest stand, cultural operations such as thinning and removal of infected residual trees are accepted control operations. Treatment of ornamental or high-value trees infected with dwarf mistletoe may include pruning infected branches and removal of heavily-infected trees. In determining the level of dwarf mistletoe infection in a tree, the 6-class mistletoe rating system is used (Hawksworth and Lusher 1956) (Fig. 23). Trees with dwarf mistletoe ratings of 4, 5, or 6 are considered heavily infected. Failure to remove heavily-infected trees will result in spread of dwarf mistletoe to nearby trees of the same species, eventually causing deterioration of such trees.

Hawksworth, Stewart, and Bailey (1968) provide the following pruning guide for dwarf mistletoe-infected ponderosa pine: "Branches 1.0 inch in diameter may be pruned if shoots do not occur closer than 6 inches from the bole. For each 1-inch increase in branch diameter, the minimum safe distance is increased by 2 inches." Hawksworth (1961) provided additional information relative to control of dwarf mistletoe on ponderosa pine. Guidelines for control of dwarf mistletoe on ponderosa pine may be applied in general to other tree species infected with various dwarf mistletoes of the Southwest.

Figures 5-12 and Table 1 provide information on identification, hosts, and distribution of dwarf mistletoes in Arizona and New Mexico. Dwarf mistletoes of the Southwest can be most easily identified by determining their host and geographic location of the host. Although some mistletoes may infect trees other than their principal host, generally, identification of the host and location will provide an adequate basis for identifying the dwarf mistletoe species. Personnel from the Forest Insect and Disease Management Staff Unit in Albuquerque will provide assistance in identifying host-parasite combinations not listed in Table 1. Little's (1950) guide to native trees in New Mexico and Arizona will help identify host trees.

### **True Mistletoes**

Seven species of true mistletoe occur on trees and shrubs in Arizona and New Mexico. Three true mistletoes commonly infect various species of hardwood trees and shrubs, while the remaining four



species infect coniferous trees. The biology of true mistletoes occurring on hardwoods has been outlined by Scharpf and Hawksworth (1974).

Figure 24 summarizes several features that differentiate the true and dwarf mistletoes. True mistletoes are generally leafy plants, while the dwarf mistletoes have no leaves. The two exceptions to this characteristic are **Phoradendron juniperinum** and **P. californicum**, which are leafless species of true mistletoe. A second differentiating character is the size of the mistletoe plant. Dwarf mistletoe plants vary in size from bud-like protrusions to shoots of nearly 1 foot in length. True mistletoe shoots vary from about 6 inches to several feet in length. A third differentiating character is the method of seed dispersal. True mistletoe seeds are disseminated by birds that feed on the berries of the mistletoe plant. Mistletoe seeds pass through the avian digestive tract and are disseminated in the feces. Dwarf mistletoe plants have explosive fruits which propel seeds into the surrounding area. Finally, true mistletoes, although parasitic, produce much of their own food and depend on their host mainly for water and minerals. Thus, the true mistletoes have less harmful effects on their host than dwarf mistletoes.

Effects on the host tree or shrub infected with true mistletoe may take several forms. Heavily-infected trees have reduced growth rates and often are predisposed to other insect or disease problems. Swellings often occur at infection sites and heavily-infected branches may be broken during windstorms or snowstorms (Scharpf and Hawksworth 1974). True mistletoes on conifers have more severe effects on their host than those on hardwoods and may result in death of their host.

Control of true mistletoes in forest stands is seldom practiced because the primary hosts are noncommercial tree species. However, high-value trees on homesites or in recreation areas may be pruned to reduce competition between mistletoe and the host. Removal of heavily-infected trees also provides a means of mistletoe suppression. Temporary reduction in spread of mistletoe may be accomplished by breaking off mistletoe shoots. This procedure would require repetition at 2- to 3-year intervals (Scharpf and Hawksworth 1974).

True mistletoe species on hardwoods can be identified by determining their host. The conifer-infecting true mistletoes cannot be identified to species by host determination, with the exception of **P. bolleanum** subsp. **pauciflorum**, which occurs only on white fir. Characteristics



of the mistletoe plant differentiate the remaining three species of true mistletoe. The identifying character of **P. juniperinum** is the absence of leaves on the plant. **P. bolleanum** subsp. **densum** has smooth-surfaced leaves, while the leaf surface of **P. capitellatum** is quite hairy. Figures 13-22 and Table 2 provide further information relative to identification, hosts, and distribution of true mistletoes in Arizona and New Mexico. The map on the back cover shows the location of National Forests in Arizona and New Mexico.



## Literature Cited

- Baranyay, J. A. 1972. Dwarf mistletoe in British Columbia. Can. Forest Serv., Pacific Forest Res. Centre, Insect and Dis. Surv. Pest Leaflet. 44.9 pp.
- Hawksworth, F. G. 1961. Dwarfmistletoe of ponderosa pine in the Southwest. U.S. Dep. Agr. Tech. Bull. 1246. 112 pp.
- Hawksworth, F. G., and D. P. Graham. 1963. Dwarf mistletoes on spruce in the western United States. Northwest Sci. 37(1): 31-38.
- Hawksworth, F. G., and A. A. Lusher. 1956. Dwarf mistletoe survey and control on the Mescalero-Apache Reservation, New Mexico. J. Forestry 54: 384-390.
- Hawksworth, F. G., and D. Wiens. 1972. Biology and classification of dwarf mistletoes(**Arceuthobium**). U.S. Dep. Agr. Handbook No. 401. 234 pp.
- Hawksworth, F. G., J. L. Stewart, and W. F. Bailey. 1968. You can save your pines from dwarf mistletoe. U.S. Dep. Agr., Forest Serv. Res. Pap. RM-35. 20 pp.
- Little, E. L. 1950. Southwestern trees: a guide to native species of New Mexico and Arizona. U.S. Dep. Agr. Handbook No. 9. 109 pp.
- Scharpf, R. F., and F. G. Hawksworth. 1974. Mistletoes on hardwoods in the United States. U.S. Dep. Agr. Forest Serv., Forest Pest Leaflet. 147. 7 pp.

For assistance or further information, contact any one of the following:

U.S. Forest Service  
Forest Insect and Disease Management  
517 Gold Avenue, SW  
Albuquerque, New Mexico 87102  
Telephone: (505) 766-2440

New Mexico Department of Agriculture  
P.O. Box 6  
Albuquerque, New Mexico 87102  
Telephone: (505) 766-3914

Arizona State Land Department  
1624 West Adams, Room 419  
Phoenix, Arizona 85007  
Telephone: (602) 271-4626

Table 1.—Principal hosts and distribution of dwarf mistletoes in Arizona and New Mexico.<sup>1</sup>

| Dwarf mistletoe species                                    | Common name                        | Principal hosts                 | Distribution by National Forest                        |
|--|------------------------------------|---------------------------------|--|
| <b>Arceuthobium vaginatum</b><br>subsp. <b>cryptopodum</b> | Southwestern dwarf mistletoe       | Ponderosa pine                  | All  |
| <b>Arceuthobium apacheum</b>                               | Apache dwarf mistletoe             | Southwestern white pine         | Apache-Sitgreaves, Cibola,<br>Coronado, Gila, Lincoln  |
| <b>Arceuthobium blumeri</b>                                | None                               | Southwestern white pine         | Coronado   |
| <b>Arceuthobium gillii</b>                                 | Chihuahuah pine dwarf<br>mistletoe | Chihuahuah pine                 | Coronado   |
| <b>Arceuthobium cyanocarpum</b>                            | Limber pine dwarf mistletoe        | Limber pine<br>Bristlecone pine | Coconino   |
| <b>Arceuthobium divaricatum</b>                            | Pinyon dwarf mistletoe             | Pinyon<br>Single-leaf pinyon    | All, except Coronado                                   |
| <b>Arceuthobium douglasii</b>                              | Douglas-fir dwarf mistletoe        | Douglas-fir                     | All  |
| <b>Arceuthobium microcarpum</b>                            | Western spruce<br>dwarf mistletoe  | Engelmann spruce<br>Blue spruce | Apache-Sitgreaves, Coconino,<br>Coronado, Gila, Kaibab |
| <b>Arceuthobium abietinum</b><br>f. sp. <b>concoloris</b>  | White fir dwarf mistletoe          | White fir                       | Only in Grand Canyon<br>National Park                  |

<sup>1</sup> U.S. Dep. Agr., Forest Serv. Manual, R-3 Supplement No. 5, 1971, Sec. 5261; Hawksworth, F. G., and D. Wiens. 1972. Biology and classification of dwarf mistletoes (**Arceuthobium**). U.S. Dep. Agr. Handbook No. 401. 234 pp.



Table 2. — Principal hosts and distribution of true mistletoes in Arizona and New Mexico.<sup>1</sup>

| True mistletoe species                                  | Principal hosts   | Distribution by National Forest                            |
|---|---|--|
| <b>Phoradendron tomentosum</b>                          | At least 60 hardwood species, but not on oaks   | Coconino, Coronado, Gila, Tonto                            |
| <b>Phoradendron villosum</b>                            | Various species of oak  | Coconino, Coronado, Gila, Kaibab, Lincoln, Prescott, Tonto |
| <b>Phoradendron californicum</b>                        | Leguminous trees and shrubs   | Coronado, Prescott, Tonto                                  |
| <b>Phoradendron bolleanum</b> subsp. <b>densum</b>      | One-seed juniper; Utah juniper; alligator juniper; red-berry juniper; Arizona cypress                         | Coconino, Coronado, Tonto                                  |
| <b>Phoradendron juniperinum</b>                         | One-seed juniper; Utah juniper; alligator juniper; Rocky Mountain juniper; red-berry juniper; Arizona cypress | All  |
| <b>Phoradendron capitellatum</b>                        | Utah juniper; alligator juniper; red-berry juniper  | Coconino, Coronado, Lincoln, Prescott, Tonto               |
| <b>Phoradendron bolleanum</b> subsp. <b>pauciflorum</b> | White fir   | Coronado — only in Santa Catalina Mountains                |

<sup>1</sup> Scharpf, R. E., and F. G. Hawksworth. 1974. Mistletoes on hardwoods in the United States. U. S. Dep. Agr., Forest Serv., Forest Pest Leaff. 147. 7 pp.; Wiens, D. 1964. Revision of the Acataphyllous species of **Phoradendron**. Brittonia 16: 11-54; Hawksworth, F. G., personal communication.



Fig. 1. — Branch swelling at dwarf mistletoe infection site caused by *A. vaginatum* subsp. **cryptopodum** on ponderosa pine (see arrow).



Fig. 2. — Bole canker caused by *A. vaginatum* subsp. **cryptopodum** infection on ponderosa pine; note resin flow and swelling of bole.



Fig. 3.—Numerous witches' brooms caused by **A. divaricatum** infections on pinyon pine; this tree died from heavy mistletoe infection.



Fig. 4.—Witches' brooms caused by **A. douglasii** infections on a Douglas-fir tree.





Fig. 5.—*A. vaginatum* subsp. *cryptopodum* infecting a ponderosa pine branch.



Fig. 6.—*A. douglasii* infecting a Douglas-fir branch; note the small size of mistletoe shoots, usually shorter than the needles.





Fig. 7.—*A. apachecum* infecting a southwestern white pine branch.



Fig. 8.—*A. divaricatum* infecting a pinyon pine branch.





Fig. 9.—**A. microcarpum** shoots on the underside of an Engelmann spruce branch; note swelling of the branch at an infection site (see arrow).



Fig. 10.—**A. cyanocarpum** infecting a bristlecone pine branch.





Fig. 11. — *A. abietinum* f. sp. *concoloris* on a white fir branch; note the numerous dwarf mistletoe fruits (see arrow); seeds are contained in these explosive fruits.



Fig. 12. — *A. gillii* infecting a Chihuahua pine branch.





Fig. 13.—*P. tomentosum* plants on a cottonwood tree (see arrows).



Fig. 14.—*P. tomentosum* infecting a cottonwood branch; note the swelling and distortion of the infected branch.





Fig. 15.—Several *P. villosum* plants on an oak tree.



Fig. 16.—*P. villosum* plant on an oak branch; note large size and dense nature of mistletoe shoots.





Fig. 17.—*P. juniperinum* plants infecting a juniper tree; note the large number and rounded appearance of mistletoe plants (see arrow).



Fig. 18.—*P. juniperinum* plants on juniper branches; note the absence of leaves on the mistletoe plant.





Fig. 19.—*P. capitellatum* plants on a juniper tree (see arrows).



Fig. 20.—*P. capitellatum* plants on a juniper branch; note small size of leaves and color variation between the two plants.





Fig. 21.—*P. californicum* plant on a mesquite tree.



Fig. 22.—*P. bolleanum* subsp. *pauciflorum* on a white fir branch.



# 6-CLASS DWARF MISTLETOE RATING SYSTEM.

## Instructions

STEP 1: DIVIDE LIVE CROWN INTO THIRDS.

STEP 2: RATE EACH THIRD SEPARATELY. EACH THIRD SHOULD BE GIVEN A RATING OF EITHER 0, 1, OR 2 AS DESCRIBED BELOW.

- (0) No visible infections
- (1) Light infection ( $\frac{1}{2}$  or less of total number of branches in the third infected)
- (2) Heavy infection (more than  $\frac{1}{2}$  of total number of branches in the third infected)

STEP 3: ADD RATINGS OF THIRDS TO OBTAIN RATING FOR TOTAL TREE.



## Example

If this third is lightly infected, its rating is (1)

If this third is lightly infected, its rating is (1)

If this third is heavily infected, its rating is (2)

AND THE TREE, IN THIS EXAMPLE, WILL RECEIVE A RATING OF 4 (class 4 tree)

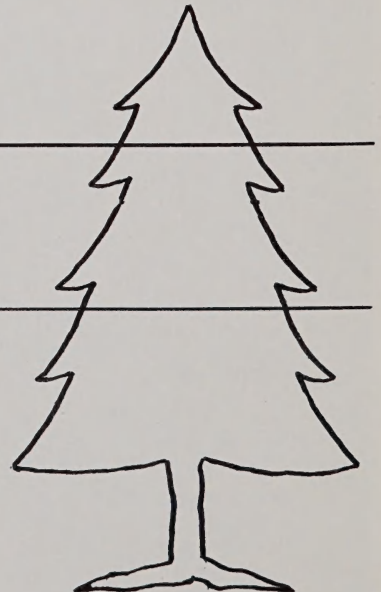
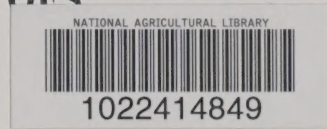


Fig. 23

# A SUMMARY OF THE FEATURES

## DIFFERENTIATING

### DWARF AND TRUE MISTLETOES



#### Dwarf mistletoes

1. Mistletoe plant is leafless.
2. Mistletoe shoots from less than 1 inch to 12 inches in length.
3. Seeds propelled from explosive fruits.
4. Few required nutrients produced by mistletoe plant.
5. Cross-section of stem is not woody.

#### True mistletoes

1. Mistletoe plant has leaves (except **P. juniperinum** and **P. californicum**).
2. Mistletoe shoots from 6 inches to about 3 feet in length.
3. Seeds not explosive; disseminated by birds.
4. Substantial portion of required nutrients produced by mistletoe plant.
5. Cross-section of stem is woody.

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